.USERS COPY GEORGIA POWER GENERATION DEPARTME

NT

14/2

VOGTLE ELECTRIC GENERATING PLANT

	NUNDERI	FO-FL-02201-06-C
FROGRAM: LICENSED OPERATOR TRAINING	REVISION	4
AUTHOR: L. FITZWATER/D. HILL	DATE :	9/7/89
APPROVED: Aboya a 2 pro	DATE:	9/12/39
INSTRUCTOR GUIDELINES		
I. LESSON FORMAT		
A. Locture with visual aids		
II. MATERIALS		
A. Overhead projector		
B. Transparencies		
C. White board with markers		
III. EVALUATION		
A. Written or oral exam in conjunction	with other lesson	plans
IV. REMARKS	~	
	N	-
( - a)	1	2
	6	)
2 PAU	10.	
RAD RAD	1 Pol	.0.)
( PAU	s to'	rge?
See ui	s into'	nge?
(See , 4, "	inciator	nge?

9202210475 920116 PDR ADOCK 05000424 S PDR

#### I. PURPOSE STATEMENT

FOLLOWING COMPLETION OF THIS LESSON, THE STUDENT WILL POSSESS THOF: NOWLEDGES OF MAIN CONTROL BOARD SWITCHES AND CONTROLS SYSTEMATICALLY IDENTIFIED FOR THE PERFORMANCE OF LICENSED OPERATOR TASKS.

II. LIST OF OBJECTIVES

- Explain what is indicated by the red and green flags on the control switches for pumps with automatic start circuits.
- Describe the response of a pump to the receipt of an automatic start signal if the control switch is in the following positions: (006000K612)
  - Auto pull-to-lock
     b. Stop pull-to-lock
- State what is indicated by the following being illuminated above a control switch:
  - a. Red lightb. Green lightc. Amber light
- 4. Explain what is indicated by the presence of a green light with a red flag on a pump control switch. Also state what is indicated by the presence of a red light with a green flag. Describe what two basic actions an operator should take if this occurs.
- 5. Explain what the control switch of an AOV is actually controlling.
- State the source of valve position indicating lights energisation/de=energization.
- Describe which values (in general) can be stroked by momentarily holding the handswitch to the OPEN or CLOSE position and releasing it to spring return to the NORMAL or AUTO position.
- State which values (in general) must have the handswitch held to the OPEN position during value travel until it is completely open.

-

## LIST OF OBJECTIVES

- Explain what would cause both red and green lights to remain illuminated on a control switch for a motor-operated and air-operated valve.
- Explain how to place a typical Hagen auto/manual control station in the AUTO and MANUAL positions. Describe the use of buttons with the up and down arrows. (FF 86.010) (191003K103)
- 11. Explain what is meant to have manual track auto for a control system.
- 12. Draw and label a typical large equipment load control circuit. Include the following:
  - a. High voltage power supply
  - b. Handswitch (include positions)
  - c. Control power supply
  - d. Circuit breaker
- 13. Describe the difference between a channel selector switch and a chancel defeat switch.
- 14. State the purpose of the following, as they relate to annunciator panels:
  - a. Light color
  - b. Flashing frequency
  - c. Audio frequency
  - d. Acknowledge button
  - e. Reset button
  - f. First out
  - g. Reflash
- Explain the function and operation of a typical speed controller used at Plant Vogtle. (191003K102)

3

1997 B	PLANT VOGTLE PROCEDURES
	13431, 120 VAC 1E INSTRUMENT DISTRIBUTION SYSTEM 13432, 120 VAC NON-1E INSTRUMENT DISTRIBUTION SYSTEM
2.	TECHNICAL SPECIFICATIONS
	SECTION 1 (1.3, 1.5, 1.6) SECTION 3/4.3
3.	VOGTLE TRAINING TEXT CHAPTER 32
4.	PLANT MANUAL CHAPTERS 7-15
5.	DESIGN MANUAL
	SECTION DC-1600 CONTROL SECTION (VOL 1)
6.	P&IDS, LOGICS, AND OTHER DRAWINGS: NONE
7.	VENDOR MANUALS AND OTHER REFERENCES
	WESTINGHOUSE TRANSIENT AND ACCIDENT ANALYSIS, VOL 1 1X6AU01-262 INSTRUCTION MANUAL FOR PROCESS CONTROL SYSTEMS 1X6AU01-526 PROCESS INSTRUMENTATION AND CONTROL 1X6AU01-527 PROCESS INSTRUMENTATION AND CONTROL 1X6AA04-30 PRECAUTIONS, LIMITATION, AND SETPOINTS
8.	PSAR
	1.2 SECTION 7.0
9.	COMMITMENTS AND OTHER REQUIREMENTS:
	FF 86.010 DEVELOP LP FOR ALL CONTROLLERS USED AT VOGTLE
10.	INSTRUCTIONAL UNITS: NONE
11.	TRANSPARENCIES
	LO-TP-65501-001 OBJECTIVES LO-TP-65501-002 AUTO/MANUAL CONTROLLER LO-TP-65501-003 REMOTE BREAKER TRIP SCHEME

4

III	. LESS	ON OUTLINE	NCTES
	I. I	NTRODUCTION	
	A	. Many control switches on the main control board	
		1. Purpe	
		2. Heaters	
		3. Valves	
		4. Annunciators	
	В	. All need to be opersted at one time or another	
	c	. Being able to recognize status is important	
	D	. Present Objectives	LO-TP-65501-001
	II. 9	RESENTATION	
	,	. Pump Control Switches	
		1. Most common is spring return to Auto or Normal	
		<ul> <li>Used on most motors (attached to pumps, etc.)</li> </ul>	
		b. L shaped handle	
		2. Can be in four status modes	
		a. Auto-after-start or Normal-after-start	Objective 1
		1) Red flag	
		b. Auto-after-stop or Normal-after-stop	
		1) Green flag	
		c. Stop Pull-to-Lock (PTL) Objective 2a	
		1) Green flag	ODJECTIVE 2D
		2) Automatic start signal disabled	Emphasize
		d. Auto Pull-to-Lock	Air compressors
		1) Automatic start signal enabled	Air removal pumps
		2) Green flag	Turning gear
		3. Three lights normally above pump controls	

5

a,

.

.

III. LESSON O	UTLINE	NOTES
	a. Red - breaker closed - pump running	Objective 3a
	b. Green - breaker open - pump stopped	Objective 3b
	c. Amber - breaker open - pump stopped	Objective 3c
	1) Pump was running	
	<ol> <li>Control switch in Auto after start or Normal-after-state</li> </ol>	
	3) Indicates pump tripped (Auto stop)	
	a) Motor protectio	
	b) Low tank level	
	c) Other system parameter abnormal	
	<ol> <li>Placing control switch to Auto or Norma after stop turns out light</li> </ol>	al
	d. Other light above control switches (typical indicator)	
	<ol> <li>Indicate auto start, oil pumps running, etc. (blue, white)</li> </ol>	
4.	Cluecking statue of Control Switch	
	a. Pump running	
	1) Rød flag - Auto after start	Objective 1
	2) Red light lit - breaker closed	
	b. Pump stopped	
	1) Green flag - Auto after stop	Objective 1
	2) Green light lit breaker open	
	c. Stop Pull to Lock	
	1) Pump disabled	
	a) Should not be running	
	b) Normal clearance position	
	<ul> <li>c) Could be a Terr Spec violation</li> <li>d. Flag - Light mismatch</li> </ul>	Objective 4

1.1

III. LESSUN GUTLINE	NOTES
1) Red flag - green light	
a) Pump stopped automatically	
(1) Ander light may be burned out	
b) Should green flag the control (by placing handswitch to Stop) and investigate	Note: Action: Match flag and and investigate
2) Green flag - red light	
a) Pump started automatically	
b) Should red flag the control and investigate auto start	Unless intended to cycle
(1) Another pump tripped	
(2) Safeguards actuation	
B. Valve Control Switches	
1. Normally two types of valves	
a. Motor operated valves (MOV)	
b. Air operated valves (AOV)	Objective 5
<ol> <li>Control switch controls solenoid in air line</li> </ol>	
<ul> <li>a) Directs air to top/bottom of diaphragm actuator to move valve</li> </ul>	
2. Close-Auto-Open spring return to auto	
a. Common type of control	
b. T shaped handle	
3. Two lights above control switch	
a. Red light only - indicates valve open	
b. Green light only - indicates valve closed	
c. Both lights lit	Objective 6
1) Valve in midposition	
d. Lights really indicate NOT position	

.

III. LESSON	OUTLINE	NOTES .
	<ol> <li>Red light - valve not closed</li> </ol>	
	2) Green light - valve not open	
	3) Done with limit switches	Objective 5
	4. Valve Opening	
	a. Isolation MOV	
	1) Place control switch to open po	eition Objective 7
	<ol> <li>Release when red light lights ( and red on)</li> </ol>	green
	<ol> <li>Valve will travel full open</li> </ol>	
	a) Cannot stop cycle with swit	ch
	4) Green light goes out	
	b. Isolation AOV	Objective 8
	1) Place control switch to open po	eition This is for a
	2) Hold until green light goes out	fail closed valve, Controi switch would work
	<ol> <li>Valve will reverse and go close switch released while green lig</li> </ol>	opposite for fail d if open valve ht lit
	5. Common Problems	
	a. Both lights on indefinitely	Objective 9
	1) MOV	
	<ul> <li>a) Valve is a throttle valve</li> </ul>	
	b) Valve tripped on thermal ov	erload
	c) Valve torque switch tripped	
	2) AOV	
	a) Valve is throttle valve	
	b) Shaft stem rotation - neith limit switch made	er
	h Doth Lighter off	

III. LESSON OUTLINE	NOTES
1) MOV breaker tripped	
2) Light bulb burned out	
C. Hagen Auto/Manual Controller Stations	
1 Three nuchuttone	LO-HO-65501-003 LO-TP-65501-002
	<b>A</b>
a. op arrow	Objective 10
1) Increases controller output	
2) Only in manual	
D. Down arrow	Objective 10
1) Decreases controller output	
2) Only in manual	
c. Auto/man	
1) Selects mode of control	
2. Present output meter (0-100%)	
a. Indicates controller output in Auto or Manual	
3. Controllers normally control valves	
a. Some other applications	
1) PD pump speed	
2) Feed pump speed	
3) Steam dumps	
b. To convert percent output to valve position	Only valid if
1) Pail open valve - 100% - closed	valve working properly. Immed-
2) Fail closed valve - 100% - open	iate position may not be propor- tional to percent
4. Manual Tracks Auto	Objective 11
a. Manual output = Auto output when selected	
5. Operation	

III. LESSON	OUTLINE			NOTES
	a. (	Determin	ing setpoint potentiometer setting	Setpoint pot is not to be used
		) AB pot var	a rule, controllers with setpoint . are related to a meter of some .iety	ar a "throttle" That's why there's a "MANUAL" mode
		2) Set poi (0-	ting is based on desired control nt of meter using 10 turn pot. 100% of meter scale)	
		3) Exa	mple:	
		æ.)	Controller associate with 0-600 prig meter	
			(1) Desired setpoint 350 psig	
			(2) % of meter scale =	
			<u>350</u> x 100% = 58.3% 500	
			(3) Pot. setting should be 5.83	(5.83 turns on pot)
		b)	Work other examples as necessary	Start FF 86.010
	b. S a	hifting nd from	controllers from Auto to Manual Manual to Auto	Objective 10
		1) Aut	o to Manual	
		a )	Push Auto/Man pushbutton	
		b)	Push up or down pushbutton	
		2) Man	ual to Auto	
		a)	Match demand to setpoint	Always
		b)	Push Auto/Man pushbutton	
		c)	Ensure controller controls properly in Auto	
	c. M	anual co	ontrol using 7300 type controllers	
		1) Manu	ual control is ALWAYS with the down pushbuttons	NEVER with the pot.

### III. LESSON OUTLINE NOTES 2) Controller must always be in the Different than MANUAL mode to use up/down pushbuttons Hagan controllers (differs from Hagan controller) (use if up/down pushbuttons placed in mode to man) 3) Caution - desired outcome does not Ex: Using up always match direction of controller pushbutton does not necessarily raise value, 4) Caution - demand position does not could be controlalways follow direction of controller ling a process parameter. Ex: Temp 5) Experience will dictate response of Ex: Demand indicontroller cation may go down as "up" pushbutton is Used End FF 86.010 D. Other Types of Control Switches 1. Electrical feeder breakers a. Most similar to pump switches b. Green-amber-red lights 1) Green light - breaker open C. Some have synchronizing switches becide control switch 1) Must be on to close breaker 2) Energizes sync circuit a) Synch check bypass d. Typical remote controlled breaker circuit Objective 12 High voltage power supply (typically 1) Would be large anything above 120V) size, have to be spring operated, a) - Would be impossible to have a

2) Control power sully (125 VDC)

make/break .... voitage

control switch large enough to

require large supply cables

Objective 13

III. LESSON OUTLINE		NOTES
	<ul> <li>a) Supplied to control switch from 125 VDC bus</li> </ul>	LO-HO-65501-002 Pg. 2
	<ul> <li>Close or open circuit completed</li> <li>by handswitch on MCB</li> </ul>	10-12-65501-002
	c) Complete open/close circuit energize coil in circuit breaker and moves slug to trip the closing latch or to trip the trip bar	
	<ul> <li>d) Slug trips latch mechanism and releases charged spring</li> </ul>	Similar mechanism for closing uses
	<ul> <li>e) Spring quickly closes/opens contacts in hi voltage line</li> </ul>	for quick, forceful close
	<li>f) Spring is recharged by 125v to electric motor</li>	
3:	) Handswitch	
	<ul> <li>Completes 125v dc open/close circuit</li> </ul>	
	b) Removes do power from breaker control circuit when in Pull-to- Lock	
4)	Circuit breaker	
	<ul> <li>a) Is actually a remote controlled relay with a high voltage /line supply) and low voltage (control power) circuit</li> </ul>	
2. On-Off	Switches	
a. Sin	aply place in desired position	
3. Transfe	er switches	
a. Mos	at are found on remote shutdown panels	
1)	) Control Room position - enable control room switches	
2)	Local position - disables control room controls, transfer control to remote shutdown panel joverrides	Note: Removes interlocks assoc- iated with control
4. Defeat	Bwitch	amicquea
4. Defeat	Bwitch	

· · · · ·

.

4

 Prevents selected parameter from being inputted to circuits (usually alarm and protective circuits)

12

A DESCRIPTION OF A DESC	
III. LESSON OUTLINE	NOTES
1) Bistable trip switch	
Examples	
Tave channel defeat	Emphasize dif-
NIS channel defeat	switch and defeat
2) Comparator trip switch on the N	I's
5. Selector switch	
<ul> <li>a. Selects channel to be inputted (usua control circuits)</li> </ul>	11y Objective 13
1) Steam generator water level con	trol
6. Pushbuttons	
a. Various applications	
7. Transfer switches	
a. Transfer control from one location t another	0
<ol> <li>Remote shutdown panel (local/co room)</li> </ol>	ntrol
E. Annunciators	
1. Provide operator warning of alarm condit	ion
2. Dark board philosophy	
a. Everything normal - all lights out w green tinted	xcept
1) Only at 100% power	May be normal to be lit at <100%
<ol> <li>Each set of annunciator panels has three associated pushbuttons</li> </ol>	power
a. Acknowledge	
b. Reset	
C. Test	
<ol> <li>Causes all on that panel to alarm-light check</li> </ol>	
4. Alarm condition	
a. Horn sounds	Objective 14c
13	

.

.

III. LESSON O	UTLINE	NOTES
	b. Window flashes mickly Objective 14b	
	c. Operator should first identify alarm	
	<ul> <li>d. Operator then depresses acknowledge push- button</li> </ul>	Objective 14d
	1) Korn stops	
	<ol> <li>Window stops flashing - stays</li> <li>illuminated</li> </ol>	
	3) Operator should respond to annunciator message in the annunciator response books	
5.	Condition clears	
	a. Horn sounds - different pitch (bell on MCB)	Objective 14c
	b. Window flashes slowly	Objective 14b
	c. Operator identifies cleared condition	
	d. Depresses Reset pushbutton	Objective 14e
	1) Window light goes out	
6.	First out annunciators	Objective 14f
	<ul> <li>After alarm acknowledged once, first out flashes faster (remains flashing quickly)</li> </ul>	
	b. Two resets required to clear alarm	
	<ol> <li>Operator must recognize first out before double reset</li> </ol>	
7,	Red annunciators	Objective 14a
	a. Indicates Safety Injection Actuations	
	b. Alarms requiring immediate operator action to protect the plant	
8.	Green annunciators	
	a. Normally lit at power	Indicate normal
	<ol> <li>RCP bearing oil lift pump low pressure (4)</li> </ol>	bower. arerm ac rorr

.....

I. LESSON	OUTLINE	NOTES
	2) SR Hi voltage failure	
	9. Amber/Orange annunciators	
	<ul> <li>Indicute reactor trips or alarms warning the operator a potentially unsafe condition exists</li> </ul>	
. F .	Typical Speed Control Circuit	Objective 15
	1. Functions to control speed of pump or motor	
	<ol> <li>Consists of multi-element controller through an automatic circuit</li> </ol>	
	3. Operation	
	a. The pump speed is caused to increase or decrease based on parameters monitored by the controller elements	
	b. Set speed compared to accual speed	
	c. Set speed determined by other parameters	
	1) Program	
	2) Discharge pressure	
	3) Flow signal	
	d. Set speed signal determined by control element	
	1) Delta P comparator	
	2) Delta flow comparator	
	3) Program error comparator	
	<ul> <li>Master control may be used if pumps operated in perallel</li> </ul>	
III. SUMMA	RY	
г А с с с	Take students to simulator if available and point out/review controller manipulation. Controller operation other than that covered by standard controllers will be covered where specifically called for in systems training (DG, AFW LRW, etc.)	

#### III. LESSON OUTLINE

#### NOTES

B. Review Objectives

- STATE WHAT IS INDICATED BY THE RED AND GREEN FLAGS ON THE CONTROL SWITCHES FOR PUMPS WITH AUTOMATIC START CIRCUITS
  - Red flag Auto After Start (Breaker closed)
  - Green flag Auto After Stop (Breaker open)
- 2. STATE THE RESPONSE OF A FUMP TO THE RECEIPT OF AN AUTOMATIC START SIGNAL IF THE CONTROL SWITCH IS IN THE FOLLOWING POSITIONS:
  - a. AUTO PULL-TO-LOCK

Auto start signal enabled get green flag ~ pump starts

b. STOP PULL-TO-LOCK

Auto start signal disabled get green flag ~ pump does not start

- STATE WHAT IS INDICATED BY THE FOLLOWING BEING ILLUMINATED ABOVE A CONTROL SWITCH:
  - a. RED LIGHT

Breaker closed - pump running

b. GREEN LIGHT

Breaker open - pump stopped

C. AMBER LIGHT

Breaker open - pump stopped

4. STATE WEAT IS INDICATED BY THE PRESENCE OF A GREEN LIGHT WITH A RED FLAG ON A CONTROL SWITCH. ALSO STATE WHAT IS INDICATED B" THE PRESENCE OF A RED LIGHT WITH A GREEN FLAG. STATE WHAT TWO BASIC ACTIONS AN OPERATOR SHOULD TAKE IF THIS OCCURS

Red flag - green light

: pump automatically stopped
: action - match flag and investigate

III. LESSON OUTLINE

NGTES

Green flag - red light

: pump started automatically : action - match flag and investigate

5. STATE WHAT THE CONTROL SWITCH OF AN AOV IS ACTUALLY CONTROLLING

Solenoid valve

 STATE THE SOURCE OF VALVE POSITION INDICATING LIGHTS ENERGIZATION/DE-ENERGIZATION

Limit switches

7. STATE WHICH VALVES (IN GENERAL) CAN BE STROKED BY MOMENTARILY HOLDING THE HANDSWITCH TO THE OPEN OF CLOSE POSITION AND RELEASING IT TO SPRING RETURN TO THE NORMAL OF AUTO POSITION

MOV will generally stroke by momentarily holding handowitch to open or closed (some exceptions exist)

8. STATE WRICH VALVES (IN GENERAL) MUST HAVE THE HANDSWITCH HELD TO THE OPEN POSITION DURING VALVE TRAVEL UNTIL IT IS COMPLETELY OPEN

NOA

9. STATE WHAT WOULD CAUSE BOTH RED AND GREEN LIGHTS TO REMAIN ILLUMINATED ON A CONTROL SWITCH FOR A MOTOR-OPERATED AND AIR-OPERATED VALVE

VOM

Valve travel at intermediate position
 Limit switches incorrectly set

NOA

Valve travel at intermediate position
 Limit switches incorrectly set

#### III. LESSON OUTLINE

# NOTES 10. STATE HOW TO PLACE A TYPICAL HAGEN AUTO/MANUAL CONTROL STATION IN THE AUTO AND MANUAL POSITIONS. DESCRIBE THE USE OF BUTTONS WITH THE UP AND DOWN ARROWS (FF 86.010) Auto to Manual Press the split lens manual button The manual half of the split lens will illuminate Manual to Auto Match setpoint and demand Use manual increase/decrease buttons as needed Press cplit lens auto button 11. STATE WHAT IT MEANS TO HAVE MANUAL TRACK AUTO FOR A CONTROL SYSTEM Ensures a bumpless transfer when switching from auto to manual Advantage - ensures a bumplees transfer when switching from auto to manual 12. DRAW AND LABEL A TYPICAL LARGE EQUIPMENT LOAD CONTROL CIRCUIT. INCLUDE THE FOLLOWING: a. HIGH VOLTAGE POWER SUPPLY b. HANDSWITCH (INCLUDE POSITIONS) C. CONTROL POWER SUPPLY d. CIRCUIT BREAKER Refer to LO-TP-65501-003 13. STATE THE DIFFERENCE BETWEEN & CHANNEL SELECTOR SWITCH AND A CHANNEL DEFEAT SWITCH Channel defeat switch prevents selected parameters from being inputted to circuits Channel Selector switch selects an instrument to input to the circuits

## III. LESSON OUTLINE

#### NOTES

14. STATE THE PURPOSE OF THE FOLLOWING, AS THEY RELATE TO ANNUNCIATOR PANELS:

a. LIGHT COLOR

Red annunciator indicates safety injection Amber/Orange indicates reactor trip

b. FLASHING FREQUENCY

Flashes quickly on alarm

C. AUDIO FREQUENCY

Horn sounds on alarm Horn sounds - different pitch on clear (bell on MCB)

d. ACKNOWLEDGE BUTTON

Pressed to acknowledge alarm Horn stops, window stops flashing

e. RESET BUTTON

When pressed light goes out

f. FIRST OUT

Tells operator which alarm caused trip first

- First out flashes after acknowledge (remains flashing guickly)
- Two resets required to clear alarm
- g. REFLASH

When slow flash changes to rapid Flash indicates the alarm condition came in again

## III. LESSON OUTLINE

#### NOTES

15. EXPLAIN THE FUNCTION AND OPERATION OF A TYPICAL SPEED CONTROLLER USED AT PLANT VOGTLE.

Function - control speed of pump or motor through an automatic circuit

Operation - set speed determined by control elements using a comparator circuit monitoring plant parameters. Set speed is compared to actual speed to give speed error.

Speed error signal causes pump controller to increase or decrease pump speed based on error signal

## C. INDICATIONS AND ALARMS

#### . Annunciators

Annunciators are found on local control panels and in the control room, and are controlled by the operator using three control buttons. An alarm is indicated by a quickly flashing window with an accompanying horn. After identifying the alarm, the operator presses the Acknowledge button, which causes the window to stop flashing (remains illuminated if alarm conditions still exist) and the horn to stop. The operator should then investigate the alarm. If he can clear the condition, a bell will sound, and the window will begin flashing, but more slowly than before. Pressing the Reset button causes the alarm window light to go out. If at any time a slow flashing alarm begins flashing rapidly again (called reflash), the initiating condition has occurred again.

First out annunciators are found only in the control room and are designed to provide the operator with information as to what has caused a reactor trip. As many alarms almost simultaneously appear immediately following a reactor trip, it would be difficult to determine the cause of the trip if a first out system were not implemented. Following a trip, after the alarm is acknowledged once, the first out flashes faster than the other alarms. Two resets are required to clear a first out, so the operator must identify the first out no later than one reset.

Annunciators illuminated in red on the MCB indicate reactor trip/turbine trips. Green lit windows indicate those normally lit at 100 percent power. (5 total: RCP bearing oil lift pump low pressure (4), and the SR high voltage failure). Normally there should be no other alarms lit at 100 percent power on the MCB during normal operation.

#### 2. Bistable Status Panels

These boxes of small, square light cubes appear in various locations around the control board. Each is labeled to display a related group of bistables. The individual cube represents a bistables condition: lit is tripped, and not lit is not tripped. An example is the status panel of the steam generators, which includes parameters such as the Hi/Low level trip bistables, Hi/Low pressure bistables, etc. The panel rows and columns are arranged as instrument channels and process channels. An example is the steam generator level channels (4). A column lists the channels in order (I, II, III, IV). Therefore, an operator can, at a glance of the status board, tell if a trip coincidence is present. It is also very useful for monitoring bistable status during testing. A trip coincidence that exists on the status board without auto action should be sized up quickly by the operator, and a manual trip actuated, if necessary.

3.

Accident Monitoring Instrumentation